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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Adam K. Brandley and John R. Irwin
Serial No.:	09/212,127
Filed:	12/15/98
For:	Electric Motor with Rotor Being a Drive Wheel
Group Art Unit:	2834
Examiner:	Clayton E. LaBalle
Attorney Docket No.:	PBRANAEM

Assistant Commissioner for Patents
Washington, D.C. 20231

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Appellants' Brief

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Thompson E. Fehr

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#8/Ext. w/Appeal Brief
Hawkins
10/31/01

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Assistant Commissioner for Patents
Washington, D.C. 20231
ATTENTION: Board of Patent Appeals and Interferences

APPELLANTS' BRIEF (37 CFR 1.192)

This brief is in furtherance of the Notice of Appeal filed in this case on April 13, 2001.

The fees required under § 1.17(a) and any required petition for extension of time for filing this brief and fees therefor are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief is transmitted in triplicate (37 CFR 1.192(a)).

This brief contains the following items, under headings of the same name and in the order given:

The final page of this brief bears the attorney's signature.

REAL PARTY IN INTEREST

The real party in interest is Adam K. Brandley and John R. Irwin.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Appellants or Appellants' legal representative which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1 through 33 were in the patent application as originally filed. None have been canceled.

Claims 1, 2, 5, 6, 8, 9, 11 through 16, 18, 21 through 26, 28, 29, and 31 through 33 have been rejected. Claims 3, 4, 7, 10, 13, 14, 17, 19, 20, 24, 27, and 30 have been objected to.

The claims that are being appealed are Claims 1 through 33.

STATUS OF AMENDMENTS

The Amendment of July 13, 2000, to claims 1, 11, 19, 21, 31, 32, and 33 has been entered.

SUMMARY OF INVENTION

The invention is summarized on page 4 through 9 of the Application:

> The present Electric Motor with Rotor Being a Drive Wheel minimizes the possibility of failure by not utilizing mechanical commutators. Moreover, the current invention does not require the use of a formula to compute a frequency for the time when the electromagnets should be energized.
>
> In the present invention, permanent magnets are placed upon one or both of the lateral sides of the drive wheel, forming the rotor. Electromagnets are

attached to the structure that supports the axle for the drive wheel, creating the stator. Such electromagnets are arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing the permanent magnets and are sufficiently close to the permanent magnets that the magnetic fields of the electromagnets and the permanent magnets will interact with one another. If permanent magnets are placed upon both of the lateral sides of the drive wheel, electromagnets may be placed upon both sides of the structure that supports the axle for the drive wheel.

A sensor mounted on the structure that supports the axle for the drive wheel simply determines when a pole of a permanent magnet approaches or is near such sensor. The sensor is so located (1) that when such pole approaches or is near the sensor, magnetic attraction or repulsion between the permanent magnet and an electromagnet will produce a force in the direction that it is desired to rotate the drive wheel and (2) that when the opposite pole of the electromagnet approaches or is near the sensor, magnetic attraction or repulsion between the permanent magnet and an electromagnet would not produce a force in the direction that it is desired to rotate the drive wheel.

Three methods are employed for utilizing the information from the sensor both (1) to assure that the electromagnets will be energized only when such energization will produce a force in the desired direction and (2) to control the speed of the drive wheel.

The control of speed depends upon the fact that the speed of the drive wheel is proportional to the average power (and, therefore, the average voltage) supplied to the electromagnets. Consequently, the speed of the drive wheel is determined by regulating the average voltage that is supplied to the electromagnets.

All three methods control such average voltage by regulating the percentage of time that voltage is supplied to the electromagnets. This is accomplished by closing a switch (preferably an electronic switch--such as a transistor, a triac, or a semiconductor-controlled rectifier), *i.e.*, substantially reducing the resistance between the terminals of the switch, in a circuit between a source of electrical energy, preferably a battery or other generator of direct current, and the electromagnets for such desired percentage of time.

To assure that force is produced only in the desired direction, the first method for closing the switch operates only between the time that the first pole of a permanent magnet approaches the sensor and the time that the second pole of the permanent magnet approaches the sensor; the second and third methods, only when a pole of polarity to which the sensor is sensitive is near such sensor. Outside of such periods, the switch is left open because no signal is sent to close such switch.

In the first method, input of the desired speed can be provided to a computer through any means that is well known in the art. The sensor is in communication with the computer and informs the computer when a pole of a permanent magnet has approached the sensor. The computer then begins producing a signal to close the switch. Preferably, the output signal from the computer will be in the form of a square wave, *i.e.*, a periodic wave which has a constant voltage amplitude when the output is being supplied and zero amplitude during the remainder of the period. The computer communicates with the switch so that the output signal from the computer is sent to the switch and causes such switch to be closed for the proportion of the period during which the output from the computer is non-zero, *i.e.* when a voltage is being supplied by the computer. The computer adjusts the non-zero proportion of the period to achieve the desired average voltage being transmitted from the source of electrical energy through the switch to the electromagnets and, consequently, the desired average speed of the drive wheel. When the sensor detects that the opposite pole of the permanent magnet has approached the sensor, the sensor so informs the computer; and the computer terminates the production of an output signal, causing the switch to be open.

In a second method, the computer is replaced with a timing circuit which establishes one specific proportion of the period during which such timing circuit produces an output voltage of constant amplitude and which produces no output voltage for the remainder of the period. This proportion can only be changed by adjusting the value of an electric component, such as a potentiometer, within the timing circuit.

When the second method is employed, the sensor, which is preferably a Hall-effect switch, will produce a current or voltage that is utilized, in any manner that is well known in the art--such as by completing an electrical circuit from a source of electrical energy, to cause the timing circuit to begin and to continue operating only while a pole of a given polarity is near the sensor. Therefore, when a pole of a permanent magnet to which the sensor is sensitive is near the sensor, the sensor will initiate and maintain the operation of the timing circuit, which in turn will periodically close a switch, preferably an electronic switch, to energize the electromagnets. Such switch will remain closed only so long as it receives a voltage output from the timing circuit. When the opposite pole of the permanent magnet (or no pole) is near the sensor, the sensor will produce no current; the timing circuit will not be activated; and the switch will, consequently, not remain closed.

Alternatively, with the second method, two sensors could be located near each other. One sensor could be sensitive to one magnetic pole; the other sensor, to the other magnetic pole. (This can be accomplished by, for example, reversing

the Hall-effect switch.) Then the average power and, consequently, the speed of the drive wheel would be increased.

Additionally, one sensor may be utilized to activate all the electromagnets; or there can be separate sensors for one or more electromagnets.

In a third method, the sensor acts just as in the second method. The sensor, however, communicates directly with the switch so that the voltage from the sensor is transmitted directly to the switch and acts just as does the output voltage from the timing circuit. Therefore, with the third method, no mechanism is included to alter the average voltage that is produced by the source of electrical power. The voltage produced by the source of electrical power is sent continuously to the electromagnets throughout the time that a pole of a permanent magnet to which the sensor is sensitive is near the sensor.

When the third method is used, the options with respect to sensors that were discussed for the second method are again available; and it is preferred to have a separate sensor for each electromagnet.

With all three methods the electrical signal from the sensor is either on or off (not a continuum of possible values). Therefore, with the first method, the computer can be programmed to invert the signal it sends to the switch. (Alternatively, and inverter could be placed--preferably through electronic switching operated by a user--between the sensor and the computer.) This will cause the switch controlling current to the electromagnets to be activated at the times other than those when magnetic attraction or repulsion between the permanent magnet and an electromagnet will produce a force in the original direction that it was desired to rotate the drive wheel. This will, consequently, at times produce no force and at other times produce a force that tends to cause the drive wheel to rotate in the reverse direction. If the drive wheel were already rotating in a forward direction, this would initially have a braking effect. If continued, it would ultimately result in the drive wheel rotating in the reverse direction. Of course, it would be more efficient to employ a sensor that is so located (1) that when a specific type of pole approaches or is near the sensor, magnetic attraction or repulsion between the permanent magnet and an electromagnet will produce a force to rotate the drive wheel in the reverse direction and (2) that when the opposite pole of the electromagnet approaches or is near the sensor, magnetic attraction or repulsion between the permanent magnet and an electromagnet would not produce a force to rotate the drive wheel in the reverse direction. And this more efficient technique is within the scope of the present invention.

Similarly, to obtain a force that tends to rotate the drive wheel in a reverse direction with the second method, an inverter is placed (preferably through electronic switching operated by a user) between the sensor and the timing circuit.

And to accomplish this feat with the third method, an inverter is placed (preferably through electronic switching operated by a user) between the sensor and the switch.

Alternatively with any of the three methods, one or more additional switches or an H-bridge may be employed to enable current to flow through the electromagnets in a reverse direction. This would, of course, tend to cause the drive wheel to rotate in the reverse direction. If the drive wheel were already rotating in a forward direction, this would initially have a braking effect. If continued, it would ultimately result in the drive wheel rotating in the reverse direction.

In the case of the first method, the computer can send signals directing the additional switch or switches to be set so that the current would flow through the electromagnets in a forward direction or signals directing the switches to be set so that the current would flow through the electromagnets in a reverse direction. For the second and third methods, some outside force (electronic or manual) would have to activate the additional switch or switches.

The computer also has the ability to protect the motor by delaying activation of the electromagnets until the wheel has attained a desired operational speed through the application of an outside force, *i.e.*, a force that does not result from the present invention. And the computer can be programmed to utilize the signal from the sensor to determine the speed of rotation of the drive wheel.

Furthermore, when it is desired to have more than one drive wheel operating with one another, a single computer can perform the desired computer functions for all the drive wheels.

Although the source of electrical power for the motor is preferably direct current, the motor will function with alternating current provided that the a. c. voltage is biased so that it never has a negative value. Furthermore, any method that is well known in the art can be used to control the average voltage that is supplied to the electromagnets, although the first two methods described above are preferred, with the first method being more preferred.

The ends of the core of each electromagnet are preferably bent toward the permanent magnets in order to increase the attractive and repulsive forces.

Moreover, it has been experimentally determined that the cores of the electromagnets perform more effectively when such cores are composed, ignoring the bent portion at the ends, of identical sections that are laminated with the plane of lamination being substantially parallel to the plane in which the electromagnet lies. Also, it has been experimentally determined that the electromagnets perform more effectively when they are wound with multi-strand wire.

Preferably, the structure that supports the axle for the drive wheel contains a cavity that communicates with the electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium to reduce heat near the electromagnets. When a heat-transfer medium is to be employed, the cavity also communicates with at least one radiating surface, such radiating surface preferably being either composed of carbon-filled nylon plastic or a metal fin.

Optionally, the electromagnets are encapsulated within a module having at least one radiating surface, such radiating surface preferably being either metal fins or fins composed of a carbon-filled nylon plastic. The module is removably inserted into the structure that supports the axle for the drive wheel. Within a cavity of the module is placed a heat-transfer medium (a fluid or gel) which communicates with both the electromagnets and the radiating surface, thereby conducting heat from the electromagnets to the radiating surface, from which such heat is transferred to the surrounding environment.

Moreover, in a still further alternative, the electromagnets can either simply be air cooled or may have liquid circulated between such electromagnets and a radiating heat sink through tubes or passages. When the tubes are utilized, a unique magnetic pump is employed that is operated by a magnetic connection between the rotating permanent magnets and a permanent magnet located in the impeller of the pump. And air cooling may be aided by the attachment of a fan to the structure that supports the axle for the drive wheel.

The simultaneous alignment of more than one electromagnet with more than one permanent magnet, which is termed "cogging," increases drag. Any technique which will prevent such cogging, such as having the spacing between electromagnets different from that between permanent magnets or having the distance between poles of electromagnets different from that between poles of adjacent permanent magnets, is, therefore preferred.

Also, to prevent energy losses caused by coupling between electromagnets, pairs of electromagnets are preferably activated alternately by the computer in the first method; by placing a flip-flop between the output of the timing circuit and the electromagnets in the second method; and, if a single sensor, is utilized for all electromagnets, placing a flip-flop between the sensor and the electromagnets in the third method.

ISSUES

There are six issues in this appeal.

The first issue is whether the drawings show every feature of the invention specified in the claims.

The second issue is whether claims 12 through 13 and 22 through 23 are patentable or contain subject matter for which the specification did not provide an enabling description, specifically for insertion of the inverter electronically between the sensor and the switch.

The third issue is whether claims 1 through 2, 11 through 12, 21 through 22, and 31 through 33 are patentable or are obvious over Stridsberg (United States patent no. 5,442,250) in view of Goldman et al. (United States patent no. 4,223,255).

The fourth issue is whether claims 5, 6, 8, 9, 15, 16, 18, 19, 25, 26, 28, and 29 are patentable or are obvious over Stridsberg (United States patent no. 5,442,250) in view of Goldman et al. (United States patent no. 4,223,255) and further in view of Wakuta (United States patent no. 5,156,579).

The fifth issue is whether claim 31 is patentable or is obvious over Stridsberg (United States patent no. 5,442,250) in view of Goldman et al. (United States patent no. 4,223,255) and further in view of Lutz (United States patent no. 5,755,302).

The sixth issue is whether claims 3, 4, 7, 10, 13, 14, 17, 19, 20, 23, 24, 27, and 30 are allowable or whether they are properly objected to as being dependent upon a properly rejected base claim.

GROUPING OF CLAIMS

As to the rejection covered by the first issue, Appellant believes the claims of the group stand or fall together.

As to the rejection covered by the second issue, Appellant believes the claims of the group stand or fall together.

As to the rejection covered by the third issue, Appellant believes the claims of the group stand or fall together.

As to the rejection covered by the fourth issue, Appellant believes the claims of the group stand or fall together.

As to the rejection covered by the fifth issue, Appellant believes the claims of the group stand or fall together.

As to the rejection covered by the sixth issue, Appellant believes the claims of the group stand or fall together.

ARGUMENT

Rejections under 35 U.S.C. § 112

In his Office Action of October 13, 2000, the Examiner has stated:

> The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the inverter connected between the switch and sensor as set forth in claims 12 and 22 must be shown or the feature(s) canceled from the claim(s). Specifically, Applicant's disclosure is lacking any information about how the inverter is "electronically Inserted" between the switch and the sensor. Many circuit configurations could be envisioned which would meet this limitation. Applicant's disclosure does not even show a simple line connecting the inverter and the sensor. "Electronically inserted" could also include placing the inverter in electric fields with no physical connection at all between the inverter or the sensor elements. The use of this phrase in the claim renders the language unclear. No new matter should be entered.

And the Examiner has continued:

> Claims 12-13 and 22-23 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a

way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant's disclosure does not provide an enabling description of the inverter electronically inserted between the sensor and the switch. For further explanation see the above objection to the drawings.

The Applicant respectfully suggests that the disclosure is enabling for one of ordinary skill in the field of electric motors.

Lines 17 through 24 on page 13 of the specification provide:

> To cause the drive wheel **1** to tend to rotate in a reverse direction when the first method is utilized, the computer **5** can be programmed to invert the output signal that it sends to the switch **31**. (Alternatively, an inverter **33** can be placed--preferably through electronic switching directed by the computer **5**--between the sensor **3** and the computer **5**.) To accomplish this same goal when the timing circuit **50** is employed, the inverter **33** is placed (preferably by electronic switching operated by a user) between the sensor **3** and the timing circuit **50**. And to achieve a similar result with the third method, the inverter **33** is placed (preferably by electronic switching operated by a user) between the sensor **3** and the switch **31**.

The Examiner has even stated, "Many circuit configurations could be envisioned which would meet this limitation." One of ordinary skill in the field could simply use any of these circuit configurations.

The Appellant would, however, be pleased to show the necessary switches in the drawings if the Board would care to suggest this be done.

Rejections under 35 U.S.C. § 103

The Examiner has declared:

> Claims 1-2, 11-12, 21-22 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stridsberg in view of Goldman.
>
> Stridsberg discloses an electric motor having a drive wheel (102) with permanent magnets (101) attached to it, electromagnets (110) arranged opposite the permanent magnets, a sensor (112), a switch (411,421,431,413,423,433) and a computer (451). The assembly is supported by a structure (109). The controller

of Stridsberg provides an inverting function to change the switches in order to effect braking of the motor. However, Stridsberg does not disclose the electromagnets arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing the permanent magnets.

Goldman teaches that it is well known in the art to form an electric drive of a motor with electromagnets (4,5) arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing the permanent magnets (7,8). As is well known in the art, such placement of the electromagnets and permanent magnets does not effect the operation of the motor, but do allow alteration of the size of the motor to minimize an axial dimension of the device while maintaining the desired mechanical output from the machine.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the motor of Stridsberg such that the electromagnets arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing the permanent magnets, as disclosed by Goldman, in order to allow the size of the motor to be minimized in a desired direction.

As the Examiner correctly observes Stridsberg does not disclose the electromagnets arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing the permanent magnets.

The critical distinguishing feature in each of the device claims is:

one or more permanent magnets attached to said drive wheel with opposite magnetic poles adjacent to one another;

one or more electromagnets attached to said structure and arranged generally in a plane that is substantially parallel to the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

. . .

And the analogous critical distinguishing steps of the method claims are:

attaching to said drive wheel one or more permanent magnets with opposite magnetic poles adjacent to one another;

attaching to said structure one or more electromagnets arranged generally in a plane that is substantially parallel to the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said

permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

. . .

For further clarity, claims 1, 11, 21, 31, 32, and 33 as well as the disclosure have been amended expressly to assert that the electromagnets are in a plane that is substantially parallel to, *but not within*, the plane or planes containing the electromagnets. Applicant believe that the word "parallel" implicitly conveys the same understanding and that Figures 2, 3, 5, 6, 9, 10, 11, 12, 13, 14, 15, and 16 reinforce such belief. At least, Applicant respectfully suggests, the figures provide any requisite antecedent basis.

The Stridsberg patent, United States patent no. 5,442,250, explains, on lines 5 through 8 of column 11 and 16 through 19 as well as 29 through 30 of column 12:

> The essential parts in FIG. 1 as regards this invention are the rotor **101**, the stator **110** and the protruding parts of the windings **111**. These parts forms [*sic*] a "ring" or a cylinder. . . .
>
> The outer rotor **101** in FIG. 2 comprises an outer cylindrical ring **201**of a magnetically permeably material like iron and magnet poles **202** of permanent magnet material . . . .
>
> The stator as indicated at **110** in FIG. 1 comprises a base ring **203** . . . .

Thus, the elements containing the various magnets in Stridsberg are two cylinders or rings with the magnets on parts of the cylinders that face each other. The magnets are not in parallel planes. They are in the same plane.

The motor of Stridsberg is a radial motor whereas the motor of the present invention is an axial motor.

On pages 121 through 122 of *Brushless Permanent-Magnet Motor Design* by Duane C. Hanselman, published by McGraw-Hill, Inc., copyrighted 1994, ISBN 0-07-026025-7, the following explanation is given:

> Two topologies were identified at the beginning of Chap. 4. When magnet flux travels in the radial direction and interacts with current flowing in the axial direction, torque is produced. Likewise, magnet flux traveling in the axial direction and interacting with radial current flow produces torque. These topologies are called radial and axial flux, respectively. The radial flux topology is the familiar cylindrical motor considered earlier in this chapter. A motor having axial flux topology is often called a pancake motor because the rotor is a flat disk.

Moreover, this book teaches away from the present invention, indicating on page 122, that a stator should be on both sides of the rotor for motors having axial flux topology in order to have ". . . the rotor-stator attractive forces . . . balanced and no net axial or thrust load . . . on the motor bearings . . . ."

The Examiner attempts to overcome this lack of Stridsberg by asserting that Goldman teaches "an electric drive of a motor with electromagnets (4,5) arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing the permanent magnets (7,8)."

Unfortunately, this is not true.

As is evident from the text and drawings from the present Application which have been cited above, the permanent magnets and the electromagnets have a major dimension which lies within the plane. In the case of the specific embodiment in the drawings, the magnets are shaped like an arc or rectangle.

The permanent magnets and the electromagnets of Goldman are all U-shaped, and neither the U's of the electromagnets nor the U's of the permanent magnets are oriented within a plane, let alone planes that are parallel to one another as required by the claims in question. In Goldman each U-shaped electromagnet is paired with a similar U-shaped electromagnet with their backs together and their open ends facing outward. Beyond each of these U-shaped

electromagnets is a Permanent magnet with its open end facing inward toward a U-shaped electromagnet. Thus, a given plane contains two U-shaped permanent magnets and two U-shaped electromagnets. The motor of Goldman has a number of planes radiating from a central core, each plane containing two pairs of oppositely oriented electromagnets and two pairs of oppositely oriented permanent magnets such that an opening of one electromagnet faces the opening of one permanent magnet while the opening of the other electromagnet faces the opening of the other permanent magnet.

In any event, as indicated above, all the electromagnets and all the permanent magnets of Goldman do not lie within planes that are parallel to one another, as required by the claims in question.

Therefore, claims 1, 2, 11, 12, 21, 22, and 31 through 33 are patentable and not obvious over Stridsberg in view of Goldman.

Next the Examiner has proclaimed:

> Claims 5-6, 8-9, 15-16, 18-19, 25-26 and 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stridsberg in view of Goldman and further in view of Wakuta ('579).
>
> Stridsberg and Goldman disclose the electric motor essentially as claimed except for a cavity in which a heat transferring or heat absorbing material is provided along with a radiating surface.
>
> Wakuta teaches that it is well known to provide a cavity (20) in which a heat transferring material (oil) is circulated to cool the motor windings. A radiating surface (14, 15) is provided to cooperate with the cavity to remove heat from the material. Thus, the motor is efficiently cooled.
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to have provided, in the motor of Stridsberg and Goldman, a cavity with a heat transferring or absorbing material therein in communication with the electric motor in order to cool the electric motor, as shown by Wakuta. It would have been further obvious to have provided a radiating surface, as disclosed by

Wakuta, to remove heat from the material whereby the electric motor will be efficiently cooled.

> Wakuta discloses several cavities (1,2,3 and 20) which contain a heat absorbing material.

First, Appellant respectfully notes that this last statement is incorrect. The identified areas all contain oil, which the Examiner, himself, has identified as a heat-transferring material that is circulated. Nothing in Wakuta suggests that oil need not transfer heat but can absorb sufficient heat without transfer to eliminate the requisite heat from the motor.

Thus, Wakuta (United States patent no. 5,156,579) does not teach a cavity containing a heat-absorbing medium; and the oil in Wakuta is circulated by an oil pump motor **16**. The present invention does not require circulation for the claims in question. The heat can be transferred without any flow of the heat-transfer medium, such as through conduction.

But, in any event, Appellant respectfully observes that the fact the present invention is not, as discussed above, obvious over Stridsberg in view of Goldman by itself renders claims 5, 6, 8, 9, 15, 16, 18, 19, 25, 26, 28, and 29 patentable and not obvious over Stridsberg in view of Goldman and further in view of Wakuta.

Finally, the Examiner observes:

> Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stridsberg in view of Goldman and further in view of Lutz.
>
> Stridsberg and Goldman disclose the electric motor essentially as claimed except for providing input from the user to program the controller and inverter between the sensor and the switches.
>
> Lutz teaches that it is well known to allow user input to a computer controlled electric motor system in order to program the computer with the desired operation of the system, see figure 3.
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to have allowed user input to the controller of Stridsberg and

Goldman in order to select the desired operating characteristics of the system, as shown by Lutz.

Again, the preceding explanation of the distinguishing features of the present invention as compared to Stridsberg in view of Goldman, itself, renders claim 31 patentable and not obvious.

In concluding this Argument, Appellant respectfully notes that since the claims upon which claims 3, 4, 7, 10, 13, 14, 17, 19, 20, 23, 24, 27, and 30 are dependent are patentable; therefore, claims 3, 4, 7, 10, 13, 14, 17, 19, 20, 23, 24, 27, and 30 should be allowed and not be objected to as being dependent upon a rejected base claim.

Appellant respectfully requests that the Board reverse the decision of the Examiner and rule that the claims under appeal are patentable.

APPENDIX
OF
CLAIMS INVOLVED IN THE APPEAL

The claims are as follows:

1. An electric motor, which comprises:

a drive wheel;

a structure to which said drive wheel is rotatably attached;

one or more permanent magnets attached to said drive wheel with opposite magnetic poles adjacent to one another;

one or more electromagnets attached to said structure and arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

a sensor that determines the location of said permanent magnets;

a switch for activating said electromagnets by connecting said electromagnets to a source of electrical power; and

a computer, said computer being capable of receiving input of the desired speed of rotation for said drive wheel, said computer being in communication with said sensor so that said computer is informed by said sensor about the location of said permanent magnets, said computer also being in communication with said switch in order to close said switch, said computer being capable of being programmed to produce a signal to close said switch periodically from the time a pole of one of said permanent magnets has approached said sensor until the opposite pole of said permanent magnet approaches said

sensor, and said computer producing such a periodic signal to close said switch that the total period said switch is closed will create an average voltage that produces the desired speed of rotation for said drive wheel.

2. The electric motor as recited in claim 1, wherein:

said computer has been further programmed to have the capability to invert the signal it sends to said switch.

3. The electric motor as recited in claim 2, further comprising:

a magnetic pump containing a magnet, which magnetic pump is operated by interaction between said permanent magnets and the magnet in said magnetic pump;

a radiating heat sink; and

a passage for transporting a cooling fluid from said magnetic pump, past said electromagnets, to said radiating heat sink, and back to said magnetic pump.

4. The electric motor as recited in claim 2, further comprising:

a module encapsulating one or more of said electromagnets, having a radiating surface, and containing a cavity that communicates with both said electromagnets and the radiating surface so that a heat-transfer medium can be placed into such cavity, said module being removably insertable into said structure.

5. The electric motor as recited in claim 2, wherein:

said structure contains a cavity that communicates with said electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium.

6. The electric motor as recited in claim 5, further comprising:

at least one radiating surface, said radiating surface communicating with said cavity.

7. The electric motor as recited in claim 1, further comprising:

a module encapsulating one or more of said electromagnets, having a radiating surface, and containing a cavity that communicates with both said electromagnets and the radiating surface so that a heat-transfer medium can be placed into such cavity, said module being removably insertable into said structure.

8. The electric motor as recited in claim 1, wherein:

said structure contains a cavity that communicates with said electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium.

9. The electric motor as recited in claim 8, further comprising:

at least one radiating surface, said radiating surface communicating with said cavity.

10. The electric motor as recited in claim 1, further comprising:

a magnetic pump containing a magnet, which magnetic pump is operated by interaction between said permanent magnets and the magnet in said magnetic pump;

a radiating heat sink; and

a passage for transporting a cooling fluid from said magnetic pump, past said electromagnets, to said radiating heat sink, and back to said magnetic pump.

11. An electric motor, which comprises:

a drive wheel;

a structure to which said drive wheel is rotatably attached;

one or more permanent magnets attached to said drive wheel with opposite magnetic poles adjacent to one another;

one or more electromagnets attached to said structure and arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

a sensor that produces a current only so long as a pole, having a given polarity, of one of said permanent magnets is near said sensor;

a switch for activating said electromagnets by connecting said electromagnets to a source of electrical power; and

a timing circuit, said timing circuit being in communication with said sensor, said timing circuit also being in communication with said switch in order to close said switch, said timing circuit producing a periodic signal to close said switch only while said sensor produces a current, and said timing circuit producing a periodic signal to close such switch wherein the total period said switch is closed is fixed by the value of an electronic component within said timing circuit.

12. The electric motor as recited in claim 11, further comprising:

an inverter, said inverter being electronically inserted by a user between said sensor and said timing circuit, for causing an inversion of any electronic signal that is sent from said sensor to said timing circuit.

13. The electric motor as recited in claim 12, further comprising:

a magnetic pump containing a magnet, which magnetic pump is operated by interaction between said permanent magnets and the magnet in said magnetic pump;

a radiating heat sink; and

a passage for transporting a cooling fluid from said magnetic pump, past said electromagnets, to said radiating heat sink, and back to said magnetic pump.

14. The electric motor as recited in claim 12, further comprising:

a module encapsulating one or more of said electromagnets, having a radiating surface, and containing a cavity that communicates with both said electromagnets and the radiating surface so that a heat-transfer medium can be placed into such cavity, said module being removably insertable into said structure.

15. The electric motor as recited in claim 12, wherein:

said structure contains a cavity that communicates with said electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium.

16. The electric motor as recited in claim 15, further comprising:

at least one radiating surface, said radiating surface communicating with said cavity.

17. The electric motor as recited in claim 11, further comprising:

a module encapsulating one or more of said electromagnets, having a radiating surface, and containing a cavity that communicates with both said electromagnets and the radiating surface so that a heat-transfer medium can be placed into such cavity, said module being removably insertable into said structure.

18. The electric motor as recited in claim 11, wherein:

said structure contains a cavity that communicates with said electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium.

19. The electric motor as recited in claim 17, wherein:

at least one radiating surface, said radiating surface communicating with said cavity.

20. The electric motor as recited in claim 11, further comprising:

a magnetic pump containing a magnet, which magnetic pump is operated by interaction between said permanent magnets and the magnet in said magnetic pump;

a radiating heat sink; and

a passage for transporting a cooling fluid from said magnetic pump, past said electromagnets, to said radiating heat sink, and back to said magnetic pump.

21. An electric motor, which comprises:

a drive wheel;

a structure to which said drive wheel is rotatably attached;

one or more permanent magnets attached to said drive wheel with opposite magnetic poles adjacent to one another;

one or more electromagnets attached to said structure and arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

a sensor that produces a voltage only so long as a pole, having a given polarity, of one of said permanent magnets is near said sensor; and

a switch for activating said electromagnets by connecting said electromagnets to a source of electrical power, said switch being in communication with said sensor and said switch being closed when and only when said switch receives voltage from said sensor.

22. The electric motor as recited in claim 21, further comprising:

an inverter, said inverter being electronically inserted by a user between said sensor and said switch, for causing an inversion of any electronic signal that is sent from said sensor to said switch.

23. The electric motor as recited in claim 22, further comprising:

a magnetic pump containing a magnet, which magnetic pump is operated by interaction between said permanent magnets and the magnet in said magnetic pump;

a radiating heat sink; and

a passage for transporting a cooling fluid from said magnetic pump, past said electromagnets, to said radiating heat sink, and back to said magnetic pump.

24. The electric motor as recited in claim 22, further comprising:

a module encapsulating one or more of said electromagnets, having a radiating surface, and containing a cavity that communicates with both said electromagnets and the radiating surface so that a heat-transfer medium can be placed into such cavity, said module being removably insertable into said structure.

25. The electric motor as recited in claim 22, wherein:

said structure contains a cavity that communicates with said electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium.

26. The electric motor as recited in claim 25, further comprising:

at least one radiating surface, said radiating surface communicating with said cavity.

27. The electric motor as recited in claim 21, further comprising:

a module encapsulating one or more of said electromagnets, having a radiating surface, and containing a cavity that communicates with both said electromagnets and the radiating surface so that a heat-transfer medium can be placed into such cavity, said module being removably insertable into said structure.

28. The electric motor as recited in claim 21, wherein:

said structure contains a cavity that communicates with said electromagnets and can contain either a heat-transfer medium or a heat-absorbing medium.

29. The electric motor as recited in claim 28, further comprising:

at least one radiating surface, said radiating surface communicating with said cavity.

30. The electric motor as recited in claim 21, further comprising:

a magnetic pump containing a magnet, which magnetic pump is operated by interaction between said permanent magnets and the magnet in said magnetic pump;

a radiating heat sink; and

a passage for transporting a cooling fluid from said magnetic pump, past said electromagnets, to said radiating heat sink, and back to said magnetic pump.

31. A process for electrically powering a drive wheel, which comprises:

rotatably attaching a drive wheel to a structure;

attaching to said drive wheel one or more permanent magnets with opposite magnetic poles adjacent to one another;

attaching to said structure one or more electromagnets arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

determining the location of said permanent magnets with a sensor;

connecting a switch for activating said electromagnets between said electromagnets and a source of electrical power;

inputting to a computer the desired speed of rotation for said drive wheel;

having said sensor inform said computer about the location of said permanent magnets;

connecting said computer to said switch;

programming said computer to produce a signal to close said switch periodically from the time a pole of one of said permanent magnets has approached said sensor until the opposite pole of said permanent magnet approaches said sensor; and

producing with said computer such a periodic signal to close said switch so that the total period said switch is closed will create an average voltage that produces the desired speed of rotation for said drive wheel.

32. A process for electrically powering a drive wheel, which comprises:

rotatably attaching a drive wheel to a structure;

attaching to said drive wheel one or more permanent magnets with opposite magnetic poles adjacent to one another;

attaching to said structure one or more electromagnets arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

producing a current with as sensor that creates such current only so long as a pole, having a given polarity, of one of said permanent magnets is near said sensor;

connecting a switch for activating said electromagnets between said electromagnets and a source of electrical power;

connecting said sensor to said timing circuit;

connecting said timing circuit to said switch; and

producing with said timing circuit a periodic signal to close said switch only while said sensor produces a current, wherein the total period for which said periodic signal closes said switch is fixed by the value of an electronic component within said timing circuit.

33. A process for electrically powering a drive wheel, which comprises:

rotatably attaching a drive wheel to a structure;

attaching to said drive wheel one or more permanent magnets with opposite magnetic poles adjacent to one another;

attaching to said structure one or more electromagnets arranged generally in a plane that is substantially parallel to, but not within, the plane or planes containing said permanent magnets, said electromagnets being sufficiently close to said permanent magnets that the magnetic fields of said electromagnets and said permanent magnets will interact with one another;

producing a voltage with as sensor that creates such voltage only so long as a pole, having a given polarity, of one of said permanent magnets is near said sensor;

connecting a switch between said electromagnets and a source of electrical power; and

connecting said sensor to said switch so that said switch closes when and only when said switch receives voltage from said sensor.

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